PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 : E04B 1/76, 1/78, E04C 2/24

A1

(11) International Publication Number: WO 94/29540

(43) International Publication Date: 22 December 1994 (22.12.94)

(21) International Application Number: PCT/US93/05328

(22) International Filing Date: 3 June 1993 (03.06.93)

(71) Applicant: OWENS-CORNING FIBERGLAS CORPORATION [US/US]; Fiberglas Tower 26, Toledo, OH 43659 (US).

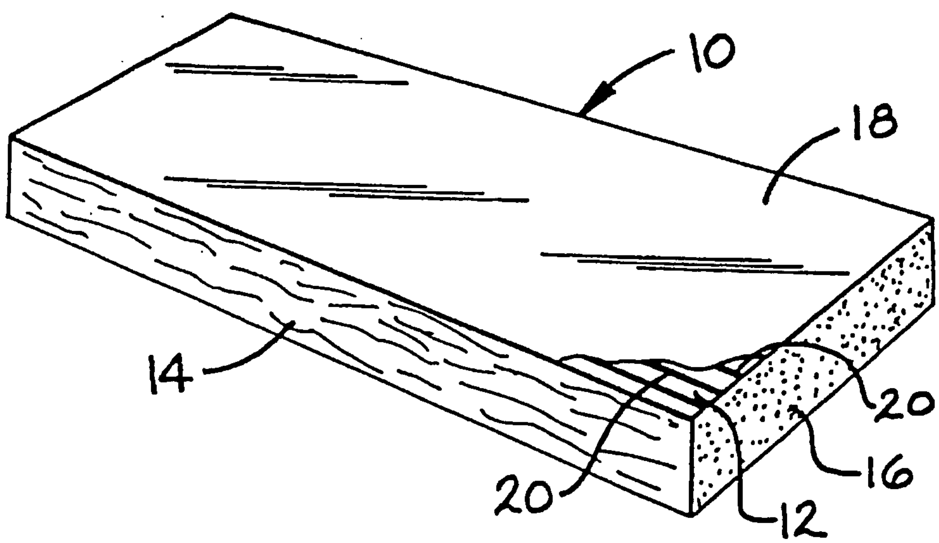
(72) Inventors: HALL, Herbert, L.; 1371 Pleasant Valley Road, Newark, OH 43055 (US). BERDAN, Clarke, II; 1878 Hankinson Road, Granville, OH 43023 (US). SCOTT, James, W.; 1738 Stonewall Drive, Newark, OH 43055 (US). WILLIAMS, Steven, H.; 3901 Worthington Road, Alexandria, OH 43001 (US). SCHELHORN, Jean, E.; 108 Edgewood Drive, Granville, OH 43023 (US).

(74) Agents: GILLESPIE, Ted, C. et al.; Fiberglas Tower 26, Toledo, OH 43659 (US).

(81) Designated States: AU, CA, JP, KR, PL, RU, UA, European patent (DE, ES, FR, GB, IT, SE).

Published
With international search report.

(54) Title: INSULATION BATT WITH LOW FRICTION FACING



(57) Abstract

A compressible mineral fiber insulation batt (10) has opposed major surfaces (12) and opposed side surfaces, and a polymeric facing (18) adhered with fastening means (20) to both of the major surfaces (12) to prevent relative movement between the facing (18) and the batt (10), where the facing (18) is less than or equal to 1.02E-5 meters (1 mil) in thickness and the facing (18) is sufficiently low mass as to exhibit a flame spread rating of 25 or less in the adhered condition.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	GB	United Kingdom	MR	Mauritania
AU	Australia	GE	Georgia	MW	Malawi
BB	Barbados	GN	Guinea	NE	Niger
BE	Belgium	GR	Greece	NL	Netherlands
BF	Burkina Faso	HU	Hungary	NO	Norway
BG	Bulgaria	IE	Ireland	NZ	New Zealand
BJ	Benin	IT	Italy	PL	Poland
BR	Brazil	JP	Japan	PT	Portugal
BY	Belarus	KE	Kenya	RO	Romania
CA	Canada	KG	Kyrgystan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo			SE	Sweden
CH	Switzerland	KR	Republic of Korea	SI	Slovenia
CI	Côte d'Ivoire	KZ	Kazakhstan	SK	Slovakia
CM	Cameroon	LI	Liechtenstein	SN	Senegal
CN	China	LK	Sri Lanka	TD	Chad
CS	Czechoslovakia	LU	Luxembourg	TG	Togo
CZ	Czech Republic	LV	Latvia	TJ	Tajikistan
DE	Germany	MC	Monaco	TT	Trinidad and Tobago
DK	Denmark	MD	Republic of Moldova	UA	Ukraine
ES	Spain	MG	Madagascar	US	United States of America
FI	Finland	ML	Mali	UZ	Uzbekistan
FR	France	MN	Mongolia	VN	Viet Nam
GA	Gabon				

DESCRIPTION

INSULATION BATT WITH LOW FRICTION FACING

TECHNICAL FIELD

This invention pertains to mineral fiber insulation products. More particularly, this invention relates to mineral fiber insulation batts having a facing adhered thereto.

BACKGROUND ART

In the manufacture of insulation batts from mineral fibers, it is a commonly-used practice to fiberize the mineral fibers from molten mineral material to distribute them on a collecting conveyor to form a pack. Typically the fibers are sprayed with an organic binder, and the pack is passed through a curing oven. The pack is then cut into individual pieces or batts. In some cases a facing material is added to the pack prior to the cutting step.

One of the uses for insulation batts is to reinsulate the attic spaces of residential dwellings. Typically, reinsulation batts are unfaced in order to avoid introducing a new vapor barrier within the insulation layers within the attic. Manufacturers' recommendations for reinsulation of attic spaces is to either use an unfaced batt, or to physically perforate the facing on a faced product by providing knife slits or other perforations in the material.

One of the problems with installing additional insulation batts in an attic space is that it is difficult for the insulation batts to be slid into place. The unfaced reinsulation batt has a high coefficient of

kinetic friction when pushed along the existing surface i.e., the unfaced existing attic insulation. This is particularly true at the edges of the attic space where the roof slope meets the attic floor. The amount of friction between two mineral batts is considerable, and it is not easy to slide the reinsulation batt along the surface of existing batts in the attic space.

Another problem associated with reinsulating residential attic spaces is that the existing and new insulation materials generate significant quantities of dust, which are irritating to the installers. Typically, reinsulation is accomplished as a do-it-yourself project by residential homeowners. It would be beneficial if batts for reinsulating attic spaces were made to be easily slid in place over existing insulation in the attic. Further, it would be beneficial to provide some means for containing dust associated with the batts used for reinsulation.

Encapsulated insulation packages are known in the art. Mclaughlin, in U.S. Patent 2,113,068 and Parker, in U.S. Patent 2,913,104, each disclose insulation packages in which mineral wool is covered by a wrapper.

Facings of different materials have been proposed for insulation batts. These include kraft paper, and polyethylene films, as disclosed in U.S. Patent 4,696,138 to Bullock. Bullock teaches a vapor-permeable polyethylene facing on four sides of a batt. The purpose of Bullock's facing is to stop convection from occurring in glass fiber insulation products.

Syme in U.S. Patent 4,927,705 discloses an insulation product covered with a vapor barrier of 1.02E-5 - 2.03E-5 meters (1 to 2 mil) polyethylene. This product is completely encapsulated, and there is no porosity for

passing moisture or for enabling compression during packaging. The ability to compress the insulation batt for packaging and have the insulation batt recover to a reasonable thickness once the package is opened for installation in the attic is a product requirement.

A very important aspect of any insulation product for retrofit situations is that the product must be nonflammable, i.e., it must pass the ASTM E84 flame spread test with a flame spread rating of 25 or less. One of the problems associated with some of the encapsulated mineral fiber insulation batts of the prior art is that the adhesive used to adhere the facing to the batt would itself contribute to a flammability problem. The adhesive prevents the product from passing the flame spread test with a flame spread rating of 25 or less. Such products invariably require expensive fire retardants to pass the test. Another problem with encapsulated insulation batts proposed to date is that the encapsulation materials prohibitively increase the cost of the insulation batt.

In view of the above, it would be desirable to provide an encapsulated mineral fiber insulation batt that has a thin facing, low coefficient of sliding friction over existing insulation in the attic, means to adhere the facing to the batt for handleability without using expensive fire retardants and without failing the ASTM flame spread test. Also, the insulation product should be at least in part highly porous to enable the rapid compression of the batt for packaging, and the batt must be capable of nearly full recovery upon the opening of the package. It is to be understood that although the product of the invention is designed for retrofit insulation in a residential attic, the product can also be used in other insulation applications such as insulating wall cavities,

basement ceilings, residential new construction, and insulation for commercial buildings.

DISCLOSURE OF THE INVENTION

There has now been developed a compressible mineral fiber insulation batt having a very thin facing (less than 1.02E-5 meters (1 mil) in thickness) adhered to the two major faces of batt, where the facing is of sufficiently low mass as to exhibit a flame spread rating of 25 or less in the adhered condition and in the absence of fire retardants, and where the batt is capable of recovering to a predetermined thickness after release from compression to one-fourth of the predetermined thickness. It has been found that by using a very thin facing material, the product can pass the ASTM flame spread test, even when the facing is adhered to the mineral fiber batt with an adhesive.

In one embodiment of the invention the facing is vapor permeable.

In another embodiment of the invention, at least one of the opposed side surfaces of the batt is either uncovered, or covered with a highly porous membrane, to enable quick air escape from the batt under conditions of rapid compression.

The facing material is less than or equal to 1.02E-5 meters (1 mil) in thickness, preferably less than or equal to 6.10E-6 meters (0.6 mil) in thickness, and most probably less than or equal to 4.06E-6 meters (0.4 mil) in thickness.

One of the valuable features of the fiber insulation batt of the invention is that the coefficient of kinetic friction of the faced batt is less than one when the faced batt is dragged across a surface of an unfaced glass fiber batt having a density of about 8.01-

12.81 Kg/M^3 (0.5 to about 0.8 pounds per cubic foot). This low coefficient of kinetic friction enables the do-it-yourself attic installation installer to push or slide the batt of the invention across the top of existing insulation in the attic, thereby facilitating easy installation of the retrofit batts into the farthest reaches of an attic.

The polymeric facing is adhered to both major surfaces of the batt with a fastening means. Preferably the fastening means is a small amount of adhesive material. The adhesive material is of a sufficiently small amount as to enable the insulation batt not to exceed a flame spread rating of 25 by the ASTM E84 flame spread test, while being sufficient to bond the facing to the mineral fiber batt and enable the batt to be picked up and handled by the facing.

In another particular embodiment of the polymeric facing is adhered to one or both of the opposed side surfaces of the batt. In this embodiment the facing is not necessarily adhered to either of the major surfaces.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of a mineral fiber insulation batt having a facing material on the major surfaces.

Figure 2 is a mineral fiber insulation batt having facing material on both the major surfaces and on the side surface.

Figure 3 is a schematic view of apparatus used in a test to evaluate the coefficient of kinetic friction of faced insulation batts.

BEST MODE FOR CARRYING OUT THE INVENTION

This invention will be described in terms of a

glass fiber insulation batt. It is to be understood that the mineral fiber insulation batt can be comprised of other types of mineral fibers, including fibers made from rock, slag and basalt.

Referring to Figure 1, insulation batt 10 is generally rectangular and has major surfaces 12, side surfaces 14, and end surfaces 16. Attached to the major surfaces is an encapsulation material or polymeric facing material 18. This material can be anything suitable to contain the dust and provide a low kinetic friction surface. Preferably the material is a polymeric material, and most preferably it is a polyethylene. A specific polyethylene material found to be useful is a high density, high molecular weight polyethylene.

In other embodiments of the invention the facing is comprised of polypropylene. A preferred polypropylene facing is a biaxially oriented polypropylene.

The facing on the major surfaces can be vapor permeable or vapor impermeable. A vapor impermeable membrane can be rendered vapor permeable by means of perforating the facing material.

The facing material is less than or equal to 1.02E-5 meters (1.0 mil) in thickness, preferably less than or equal to 6.10E-6 meters (0.6 mil) in thickness, and most preferably less than or equal to 4.06E-6 meters (0.4 mil) in thickness. The facing material must be sufficiently thin to avoid high material costs and to minimize fuel contributed during fire testing.

The facing material is attached to the major surfaces of the batt by any suitable fastening means, such as adhesive 20. The fastening means could also be, for example, velcro attachment means, sticking or a heat sealing process. A suitable adhesive is a pressure

sensitive hot melt, such as HL-2707 from H.B. Fuller Company, applied at a rate of 2.15E+0 Gm/M^2 (0.2 grams per square foot).

The fastening means must provide a bond between the facing and the mineral fiber batt sufficient to enable the batt to be handled by the facing material. Therefore, the fastening means acts to prevent relative movement between the facing and the batt.

The fastening means, particularly if it is an adhesive, must be of sufficiently low mass so as to not unduly increase the flame spread of the batt with the facing in the adhered condition. The flame spread test is the ASTM E84 test. The measurement under the ASTM E84 flame spread test must be taken with the facing material in the adhered condition. Further, the mass of the facing material and the adhesive material is sufficiently low to pass the flame spread test with a flame spread rating of 25 or less in the absence of fire retardants. For purposes of this invention, the term "absence of fire retardants" means that the material either actually contains no fire retardants, or contains fire retardants in such an insubstantial amount that the facing, in the adhered condition, would still pass the flame spread test with a flame spread rating of 25 or less if the fire retardant were left out of the product. This provides a considerable enhancement over the art in terms of material costs since a fire retardant is not needed. The test consists of determining the extent to which flames travel along the product under specified conditions when the product is exposed to a flame at one end.

As shown in Figure 1, the side surfaces are uncovered. This enables rapid compression of the batt during a packaging operation. Since most insulation batts

are highly compressed during packaging and transport, it is important for the air within the insulation package to be released rapidly during the compression process.

As shown in Figure 2, the insulation batt can be provided with side facing material 22. The side facing material can be any material to contain the dust within the insulation product, while still being sufficiently porous to enable the rapid evacuation of air from within the batt during compression. The most expedient facing material may be the same facing material used on the major surfaces, but being highly perforated. Alternatively, the facing material can be cut to produce flaps to enable air escape during compression, but present a rather solid-looking appearance under static conditions. Additional side facing materials useful for this invention would be any scrim or other open-weave material, woven or nonwoven, made from polymeric fibers or glass fibers. Preferably, the side facing material has openings in at least 10 percent of its surface during the compression process. In one embodiment of the invention, the side facing material 22, as well as the facing material 18, is adhered to the batt.

The addition of the facing material to what would normally be an unfaced batt, imparts a structure to the batt which enhances its handleability and installability in residential attics. Further, since the facing material covers the batt, any surface irregularities which would constitute a visual surface defect are covered up. Consequently, a certain amount of scrap or recycled glass fiber material may be added to the product without detracting from its visual appearance. Further, the mineral fiber insulation batt can be made with a lower amount of organic binder material than would otherwise be

the case. Preferably, the amount of binder material is within the range of from about 1 to about 7 percent by weight of the unfaced batt. Most preferably, the binder comprises between 1 and 4.6 percent by weight of the unfaced batt. Such binders are well known to those skilled in the art.

One attribute of the facing material is that it must be sufficiently slippery to enable the batt to be pushed or slid into place on top of the existing attic insulation material. Preferably, the coefficient of kinetic friction of the faced batt is less than 1.0, when the faced batt is pulled or dragged across a surface of an unfaced glass fiber batt having a density of about 8.01-12.81 Kg/M^3 (0.5 to about 0.8 pounds per cubic foot).

ASTM test D 2534-88 is a standard test method for determining the coefficient of kinetic friction for wax coatings. A test dynamically similar to D 2534-88 was used to determine the coefficient of kinetic friction of various facing materials suitable for use with mineral fiber insulation. A reference batt of R-13 glass fiber insulation was constructed. The reference batt has a density of about 11.21 Kg/M^3 (0.7 pounds per cubic foot) and measures 3.048 meters by 3.048 meters (one foot by one foot) by about 9.2 cm (3-5/8 inches). The reference batt was faced on the top side and unfaced on the bottom. The batt was dragged at a speed of 50.8 cm (20 inches) per minute across the various surfaces to be tested in accordance with the general principles of ASTM D 2534-88, and the coefficient of kinetic friction was determined by measuring the amount of frictional resistance encountered.

The apparatus used is shown in Fig. 3 in which reference batt 24 having facing 26 is pulled across the testing surface 28. The reference batt was pulled by

means of wire 30, which after being turned upwardly around roller 32, was connected to a force measuring device. Any device suitable for measuring the load on the wire, such as a force transducer or Instron load cell 34, could be used. The coefficient of kinetic friction is the measurement of the frictional force between the bottom surface of the reference batt and the top surface of the testing surface or facing material 28 to be tested.

EXAMPLE

The reference batt was dragged across five different materials according to the test procedure outlined above, with the following results.

Sample	Coefficient of Friction
Unperforated 4.06E-6 meters (0.4 mil) high density, high molecular weight polyethylene	0.826
Perforated 4.06E-6 meters (0.4 mil) high density, high molecular weight polyethylene	0.735
Kraft paper	0.186
AC plywood	2.5
Unfaced glass fiber batt	7.73

The above data show that the faced batt has a small fraction of the friction exhibited by the action of sliding one unfaced batt across the other. Preferably, the coefficient of kinetic friction is within the range of from about 0.7 to about 0.9, and most preferably it is anything less than or equal to 1.0.

The fact that the side surfaces of the batt are highly porous not only enables rapid compression by allowing the escape of air during compression, but also

facilitates the recovery of the product after the product is unpackaged in its place of intended use. Preferably, the batt is capable of recovering to a predetermined thickness after release from compression to one-fourth of that predetermined thickness. For example, if the desired nominal thickness of an R-19 glass fiber insulation batt is 15.24 cm (6 inches), the batt can be compressed to a thickness of 3.8 cm (1.5 inches), and upon release from the packaging material, the batt will self-recover to the thickness of 15.24 cm (6 inches). Most preferably, the batt is capable of recovering to a predetermined thickness after release from compression to one-sixth of that predetermined thickness.

It will be evident from the foregoing that various modifications can be made to this invention. Such, however, are considered as being within the scope of the invention.

INDUSTRIAL APPLICABILITY

The mineral fiber insulation batt of the invention can be used for additional insulation in the attic space of a residential dwelling which has already been insulated.

CLAIMS

1. A compressible mineral fiber insulation batt having opposed major surfaces and opposed side surfaces, and a polymeric facing applied to both of the major surfaces, the facing being adhered to the batt to prevent relative movement between the facing and the batt, the facing being less than or equal to 1.02E-5 meters (1 mil) in thickness, and the facing being of sufficiently low mass as to exhibit a flame spread rating of 25 or less in the adhered condition, and the batt being capable of recovering to a predetermined thickness after release from compression to one-fourth of said predetermined thickness.

2. The batt of claim 1 in which the facing is vapor permeable.

3. The batt of claim 2 in which the facing is adhered to at least one of the major surfaces.

4. The batt of claim 3 in which the facing is of sufficiently low mass as to exhibit, on the major surface to which the facing is adhered, a flame spread of 25 or less in the adhered condition and in the absence of fire retardants.

5. The batt of claim 4 in which the facing is comprised of high density, high molecular weight polyethylene.

6. The batt of claim 2 in which the opposed side surfaces are covered with a highly porous membrane, to enable quick air escape from the batt under conditions of rapid compression.

7. The batt of claim 6 in which the highly porous membrane is adhered to at least one of the side surfaces.

8. The batt of claim 7 in which the facing is less than or equal to 6.10E-6 meters (0.6 mil) in thickness.

thickness.

9. The batt of claim 8 in which the coefficient of kinetic friction of the faced batt is less than 1.0, when the faced batt is dragged across a surface of an unfaced glass fiber batt having a density of about 8.01-12.81 Kg/M^3 (0.5 to about 0.8 pounds per cubic foot).

10. The batt of claim 9 in which the facing has a thickness of less than or equal to 4.06E-6 meters (0.4 mil).

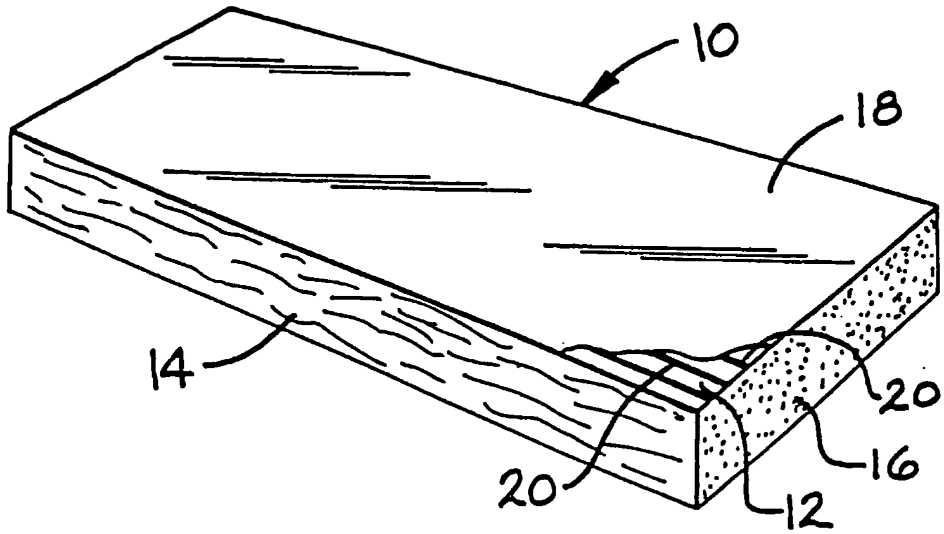


FIG. 1

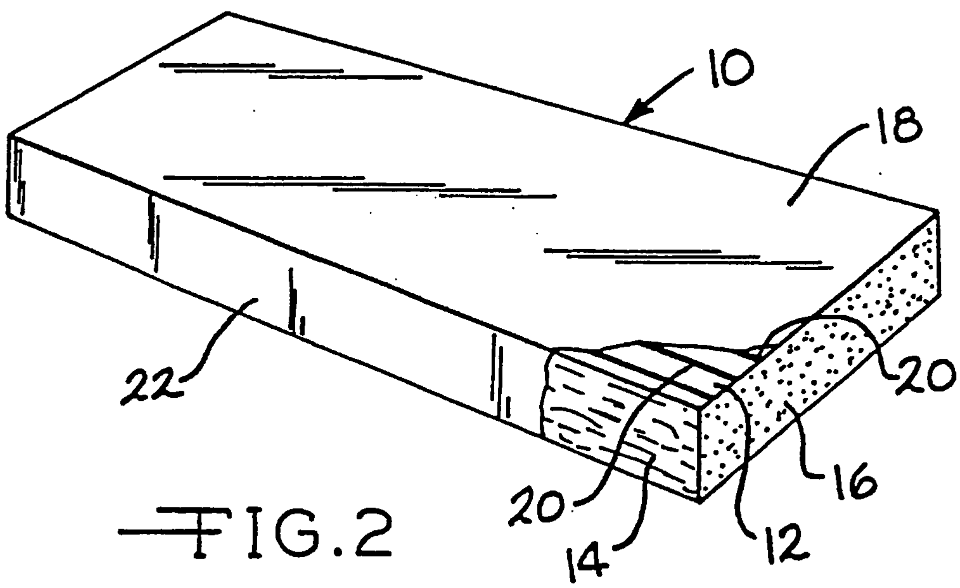


FIG. 2

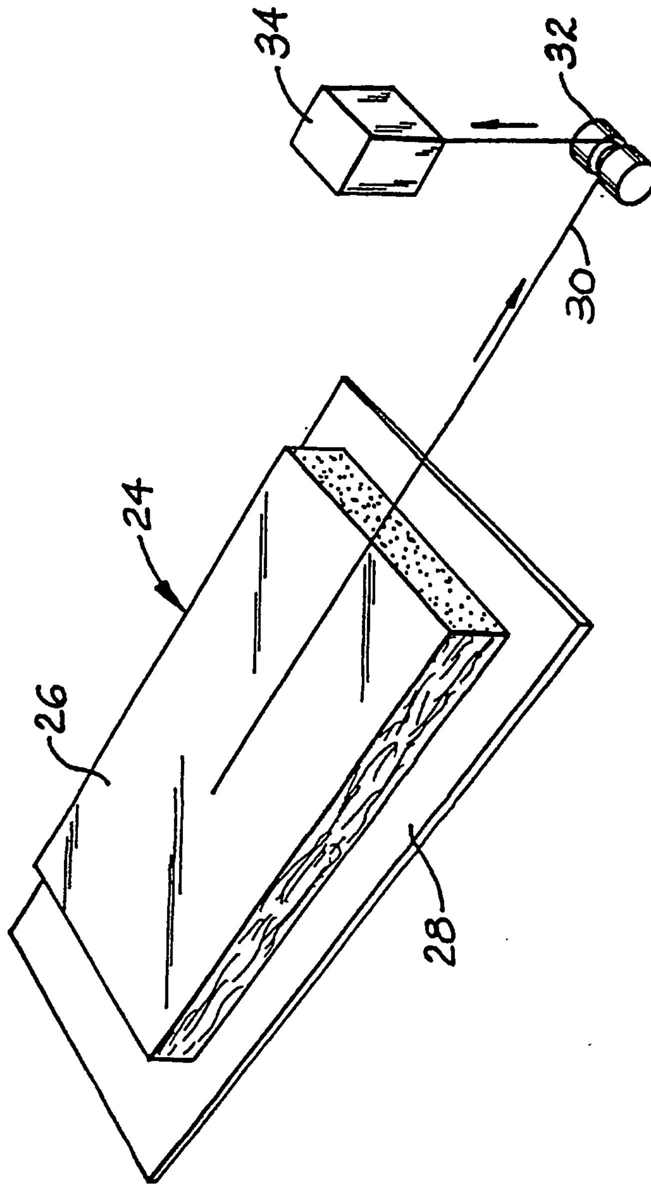


FIG.3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 93/05328

A. CLASSIFICATION OF SUBJECT MATTER
IPC 5 E04B1/76 E04B1/78 E04C2/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 5 E04B E04C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE,U,85 05 179 (SOCIETA ITALIANA VETRO-SIV S.P.A.) 23 May 1985 see the whole document ---	1-4
A	US,A,4 952 441 (A. K. BOSE ET AL.) 28 August 1990 see column 3, line 7 - column 4, line 30; figure 1 ---	1-4
A	FR,A,2 418 082 (ROCKWOOL INTERNATIONAL A/S) 21 September 1979 see the whole document ---	1
A	DE,B,12 50 767 (COMPAGNIE DE SAINT-GOBAIN) 21 September 1967 see the whole document --- -/--	1-8

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

1

Date of the actual completion of the international search	Date of mailing of the international search report
8 February 1994	28 -02- 1994

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Delzor, F

Form PCT/ISA/210 (second sheet) (July 1992)

International application No.
PCT/US 93/05328

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR,A,1 500 317 (SOCIÉTÉ NOUVELLE SIPLAST) 3 November 1967 see the whole document	1-9
A	WO,A,91 17326 (W. LINDAL) 14 November 1991 see the whole document	1,2,6

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/US 93/05328

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
DE-U-8505179	23-05-85	FR-A,B	2566443	27-12-85
US-A-4952441	28-08-90	NONE		
FR-A-2418082	21-09-79	BE-A-	874385	18-06-79
		DE-A-	2906801	06-09-79
		GB-A-	2017578	10-10-79
		NL-A-	7901555	30-08-79
		SE-A-	7901543	29-08-79
DE-B-1250767		NONE		
FR-A-1500317		NONE		
WO-A-9117326	14-11-91	AU-A-	7878091	27-11-91